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# Asymptomatic Hyponatremia In Severe Acute MalnutritionAnd Associated Predictive Factors.

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***Abstract:***
***Background:****Dyselectrolytemia in the form of hyponatremia in SAM children is a common complication.Hyponatremia leading to fatal consequencesis well known.There is lack of literature regarding hyponatremia prevalence and its associated factors in SAMchildren.*
***Objective:****This study aimed to evaluate predicting factors associated with hyponatremia in children under five years of age with severe acute malnutrition (SAM) in NRC (Nutrional Rehabilitation Centre)*
***Methods:****In thiscase-control design, we compared clinical and laboratory characteristics of children with 164(55%)and without hyponatremia 129(45%) taken from a parent population of all children under five with SAM admitted in NRC.*
***Results:****Prevalence of hyponatremia in SAM was 55%.Further it was found thatAge < 24 months{P value 0.006, Odds ratio 2.7, 95% C.I. (1.3 – 5.9)} &Hypokalemia {(P value 0.002, Odds Ratio 2.5, 95% C.I. (1.4 -4.66)} was highly statistically significant. Diarrhea and other factors were found statistically insignificant.*
***Conclusion:****Age less than 2 years, and hypokalemia in SAM were found significantly associated with hyponatremia.Asymptomatic hyponatremia should be detected early and its management in SAM should not be overlooked.*
***Keywords:*** *Hyponatremia; Severe Acute Malnutrition*

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## I. Introduction:

Severe Acute Malnutrition is defined by very low weight-for-height/length (Z- score below -3 SDof the median WHO child growth standards, ora mid-upper arm circumference < 115 mm, or by the presence of bilateral pitting oedema.

Worldwide, in 2011, one in four children (26%, 165 million) was estimated to be stunted, whereas one insix (16%, 101 million) was underweight, and one in 12 (8%, 52 million) was wasted[1]. Nearly 20 million children suffer from severe acute malnutrition, which is a lifethreateningcondition requiring urgent treatment[2].

Severe acute malnutrition (SAM) is one of the most common health problem, involving hundreds of millions of children in India.[3] According to National Family Health Survey-4, in India 7.5% of children below 60 months of age suffer from SAM and this has increased from the previous value of 6.4% children in NFHS-3.[4] Programmatically, it is helpful to categories children with SAM into complicated and uncomplicated. However, in children with severe acute malnutrition, addressing the problem through facility based approach alone is unfeasible.

Diarrhea and pneumonia accounts for approximately half the under-five deaths in India and malnutrition is believed to contribute to 61% of diarrheal deaths and 53% pneumonia deaths[5.]

Malnutrition increases the risk and worsens the severity of infections[6]. SAM children are more prone to severe infections that culminates into different co-morbid conditions and consequentially leads to electrolyte derangement due to reductive adaptation Na+ , K+ , ATPase systems of the body begin to 'shut down'.[7] Therefore, an even greater electrolyte derangement may occur when these co-morbid conditions are superimposed on SAM.World Health Organization (WHO) states this as a strong recommendation with low-quality evidence[8]. As per the WHO, serum electrolytes are measured and supplemented (potassium and magnesium) only in SAM children with complications. SAM children without complications are managed in community with Ready to Use Therapeutic Food (RUTF) which is enriched with minerals and micronutrients[9]. Severe Acute Malnutrition children are more prone to dyselectrolytemia than normal children.Hyponatremia is one of the major electrolyte disturbances found inchildren with SAM.Hyponatremia still remains poorly understood[10].There is limited information about the associated factors of hyponatremia in children with SAM.Hyponatremia in children was found associate with high mortality in SAM and hence early detection is detrimental in management of SAM[11].In our country, as RUTF is not available, children are advised home-based

energy dense food along with micronutrient supplements. Hence, their diet may still be deficient in minerals.This study aims to evaluate predicting factors associated with hyponatremia in children with SAM.

## II. Material & Method:

**Study design**
This was a case control study.
**Setting:**
The study was conducted in Nutritional Rehabilitation Centre of Department of Paediatrics, K.T. Children Hospital, Pandit DeendayalUpadhyayMedical College, Rajkot.
**Study subjects:** Children aged 1 to 60 months, admitted in Nutritional Rehabilitation Centre of Department of Paediatrics, K.T. Children Hospital, PanditDeendayalUpadhyay Medical College,Rajkot. Total 299 SAM children participated in the study.
**Study Period:** Study was conducted from January 2016 to October 2017.
**Ethical considerations**:
Study was approved by Ethical committee ofPandit DeendayalUpadhyayMedical College, Rajkot.
**Study Procedure:**Complete history and systemic examination of SAM children was done.Co morbidities were identified and managed according to WHO protocol. Laboratory examination were done.

- Hemoglobin by LabLife 3D hematological autoanalyzer&anaemia was defined as per WHO guidelines.
- Total leucocyte count by LabLife 3D hematological autoanalyzer.TLC < 4,000cells as leucopenia &TLC >16,000 was taken as leucocytosis.
- Random Blood glucose by Accu-Check® Active (Roche Diagnostics GmbH 68298 Mannheim, Germany). < 54 mg% was taken hypoglycemia.
- Urea with values >40 mmol/l as deranged& creatinine with values >0.90 as derranged.
- Serum sodium of < 135mEq/l as hyponatremia.
- Serum potassium<3.5as hypokalemia was taken in our study.

The enrolled cases were divided into two groups those with hyponatremia and those without hyponatremia.

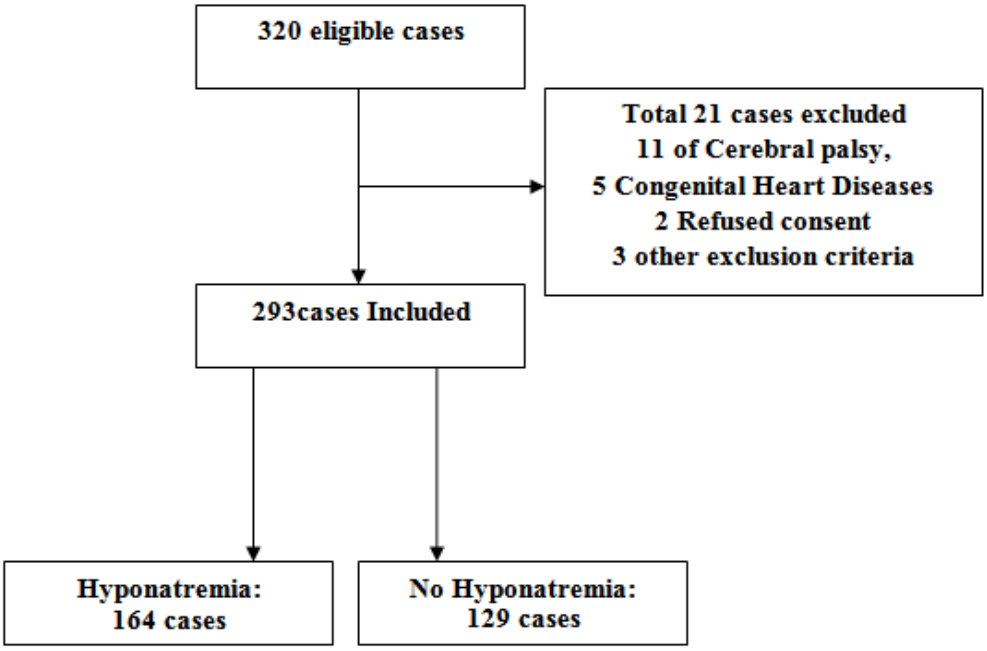


**Fig. 1** Flow trial of patients.

## III. Data Analysis

Statistical analysis was done, using the statistical package for social science (SPSS 17) for Windows Software. Continuous variables were expressed as means, standard deviation (SD), confidence intervals (95%CI), frequency and range. P value < 0.05 was taken as significant. The Univariate analysis was done for finding association separately. Multilogistic regression analysis was done for finding association of dependent factor in relation to other factor.

## IV. Results

Out of the 293 SAM children analysed for serum sodium, 164 (55%)were found to have Hyponatremia and were taken as Cases & rest 129(45%) were taken as Controls.

Mean age (SD) of SAM children with hyponatremia was 16(4) months (95% C.I. 13.8 -18.1). Mean age (SD) of control of was 15(3) months (95% C.I. 13 -18).

Table I shows clinical & laboratory characteristics of SAM children predicted to be associated with hyponatremia.It was found thatage < 24 months {P value .006, Odd ratio 2.7, 95% C.I. (1.3 – 5.9)} &Hypokalemia{( P value .002,Odd Ratio 2.5, 95% C.I. (1.4 -4.66)} was highly statistically significant.

**Table I.** Univariateanalysis of clinical & laboratory characteristics of SAM children predicted to be associated with hyponatremia

| Predicive factors | Cases (n = 164) | Controls (n= 129) | P value. | Odd Ratio | 95.0% C.I Lower | Upper |
|---|---|---|---|---|---|---|
| Age<24months | 133 | 123 | 0.006 | 2.7 | 1.3 | 5.9 |
| Male Sex | 101 | 85 | 0.466 | 1 | 0.629 | 2.019 |
| Edema | 39 | 36 | 0.5 | 0.8 | 0.4 | 1.3 |
| Tuberculosis | 19 | 20 | 0.388 | 0.7 | 0.36 | 1.416 |
| Pneumonia | 50 | 41 | 0.899 | 0.9 | 0.57 | 1.549 |
| Diarrhea | 108 | 75 | 0.09 | 1.414 | 0.880 | 2.273 |
| Anemia | 144 | 113 | 0.728 | 0.86 | 0.43 | 1.71 |
| Leucopenia | 10 | 3 | 0.328 | 2.9 | 0.79 | 11.001 |
| Leucocytosis | 36 | 27 | 0.15 | 1 | 0.59 | 1.8 |
| Uremia | 56 | 38 | 0.25 | 1.36 | 0.829 | 2.259 |
| Deranged Creatinine | 61 | 50 | 1 | 1 | 0.63 | 1.6 |
| Hypoglycemia | 24 | 18 | 0.7 | 1.1 | 0.59 | 2.279 |
| Hypokalemia | 48 | 18 | 0.002 | 2.5 | 1.4 | 4.69 |

Multilogistic regression analysis was done which showed that hypokalemia and less age were statistically significant.

## V. Discussion

Dysnatremia in the form of Hyponatremia was found in our study in majority (55%) of cases irrespective of diarrhoea. This was found to be higher than the 13.3% as reported from Gujaratby Shah et al 2014[12]. It may be because of the co morbidity of SAM children or nature of the food taken in this region.It was further observed that there was no significant difference in hyponatremia among SAM children with diarrhoea and without diarrhoea which is contrary to study from Hyderabad as reported by Menon et.al 2007[13] while in accordance with study from Nepal as reported by Mishra et al 2009[14]. Previous studies found hyponatremia to be associated with pneumonia which is contrary to our study[15]. Hyponatremia in our study was found to be associated with lesser age and hypokalemia,which cannot be compared due to lack of published work.

The prevalence of hypernatremia(Na+ > 145 mEq/dl) in children with SAM in present study was 4% which is slightly higher than 3% from Pakistan as reported by yasmeen et al 2007[16]. It may be because of higher cut off level of sodium (Na+ level > 150 mEq/dl ) by yasmeen et.al but lower than 5% and 15.7% hypernatremia in studies from Gujarat as reported by by Shah et,al 2014[12]and Madhya Pradesh as reported by Gangaraj et al 2013[17]. This may be attributed to different, geographic areas, dehydration status, and varying severity of illness.

## VI. Conclusion

Dyselectrolytemia in SAM in the form of hyponatremia is poorly understood. Age less than 2 years, and hypokalemia in SAM were found significantly associated with hyponatremia.Asymptomatic hyponatremia should be detected early and its management in SAM should not be overlooked due to fatal consequences associated with hyponatremia.

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**Competing interests:** None stated.

**What is already known?**

Dyselectrolytemia is a common complication in SAM

**What this study adds?**

Hyponatremia was found in high percentage 55% of SAM children. SAM with less than 24 months age and hypokalemia are found independently associated with hyponatremia.

## References


[1]. Joint UNICEF – WHO – The World Bank Child Malnutrition Database: Estimates for 2012 and Launch of Interactive Data Dashboardshttp://www.who.int/nutgrowthdb/jme_2012_summary_note_v2.pdf

[2]. Black RE, Allen LH, Bhutta ZA, Caulfield LE, de OnisM,Ezzati M, et al. Maternal and child undernutrition: globaland regional exposures and health consequences. Lancet.2008;371:243-60.

[3]. Sachdev HPS, Kapil U and Sheila V. Consensus Statement: national consensus workshop on management of SAM Children through medical nutrition therapy. Indian Pediatrics. 2010;47:651-4.

[4]. International Institute for population sciences. National family health survey 4. Mumbai India: International Institute of Population Science. 2016.

[5]. Black RE, Allen LH, Bhutta ZA, de Onis M, Ezzati M, Mathers C, et al. Maternal and Child undernutrition: global and regional exposures and health consequences. Lancet. 2008;371(9608):243- 60

[6]. Müller O, Krawinkel M. Malnutrition and health in developing countries. Can Med Assoc J. 2005;173:3

[7]. Inpatient Care Training Materials | Module 2. Principles of Care |FANATA-2. Government of Sudan. 2011:24.

[8]. WHO Guideline: Updates on the Management of Severe Acute Malnutrition in Infants and Children. Geneva: World Health Organization; 2013.

[9]. Indian Academy of Pediatrics, Dalwai S, Choudhury P, Bavdekar SB, Dalal R, Kapil U, et al. Consensus statement of the Indian academy of pediatrics on integrated management of severe acute malnutrition. Indian Pediatr 2013;50:399-404.

[10]. J. G. Verbalis, S. R. Goldsmith, A. Greenberg, R. W. Schrier and R. H. Sterns, "Hyponatremia Treatment Guide- lines 2007: Expert Panel Recommendations," The Ame- rican Journal of Medicine, Vol. 120, No. 11, 2007, pp. S1-S21.

[11]. A. R. Samadi, M. A. Wahed, M. R. Islam and S. M. Ah- med, "Consequences of Hyponatraemia and Hyperna- traemia in Children with Acute Diarrhoea in Bangladesh," British Medical Journal, Vol. 286, No. 6366, 1983, pp. 671-673.

[12]. Shah RH et alManagement of children with severe acute malnutrition: experience of nutrition rehabilitation centre at Baroda, Gujarat International Journal of Contemporary Pediatrics. Int J ContempPediatr. 2014 May;1(1):3-66.

[13]. 13.Y. Memon, R. Majeed, M. H. Ghani and S. Shaikh, "Se- rum Electrolytes Changes in Malnourished Children with Diarrhoea," Pakistan Journal of Medical Sciences, Vol. 23, No. 5, 2007, pp. 760-764.

[14]. S. K. Mishra, S. P. Bastola and B. Jha, "Biochemical Nutritional Indicators in Children with Protein Energy Malnutrition Attending Kanti Children Hospital, Kath- mandu, Nepal," Kathmandu University Medical Journal, Vol. 7, No. 2, 2009, pp.129-134.

[15]. Cheryl Kay Zogg, Tahmeed Ahmed, Abu SyeedGolamFaruque, Sumon Kumar Das, Gazi Imran, MohammodJobayer Chisti2 .Predictive Factors of Hyponatremia in Under-Five Severely Malnourished Children with Pneumonia Admitted to a Large Urban Hospital in Dhaka, Bangladesh: A Nested Case-Control Design.*Food and Nutrition Sciences*, 2013 ; 398-404

[16]. Yasmeen Menon, RehanaMajeed, MohammasHanifGhani, Salman Shikh. Serum electrolytes changes in a malnourished children with diarrhea. Pakistan journal of medical science,oct-december 2007 (part I). Volume 23.

[17]. Gangaraj et al .Electrolytes and Blood Sugar Changes in Severely Acute malnourished Children & its association with diarrhoea and vomiting. International Journal of Pharmaceutical Science Invention May 2013 ;33-36.


Dr. Kuldeep Singh. "Asymptomatic Hyponatremia In Severe Acute MalnutritionAnd Associated Predictive Factors." IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), vol. 18, no. 8, 2019, pp 51-54.